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Special Flood Hazard Evaluation Report

AD-A216 017

Clear Creek

Town of Freedom, Cattaraugus County, New York

Prepared
for the New York State
Department of Environmental Conservation

US Army Corps
of Engineers
Buffalo District

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This report documents the results of an investigation to determine the potential flood situation along Clear Creek within the Town of Fredom, New York. The study area extends along 24,300 feet of Clear Creek from the Cattaraugus-Wyoming County line upstream to the State Route 98 bridge, located 200 feet north of Moore Rd. This report identifies the 100-year water surface profile and associated flood plain and floodway for Clear Creek.

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SPECIAL FLOOD HAZARD
EVALUATION REPORT

CLEAR CREEK
TOWN OF FREEDOM
CATTARAUGUS COUNTY, NEW YORK

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INTRODUCTION

This Special Flood Hazard Evaluation Report documents the results of an investigation to determine the potential flood situation along Clear Creek within the town of Freedom, New York. The study was conducted by the Buffalo District, Corps of Engineers at the request of the New York State Department of Environmental Conservation, under the authority of Section 206 of the 1960 Flood Control Act, as amended. The study area extends along 24,300 feet of Clear Creek from the Cattaraugus-Wyoming County line upstream to the State Route 98 bridge, located 200 feet north of Moore Road.

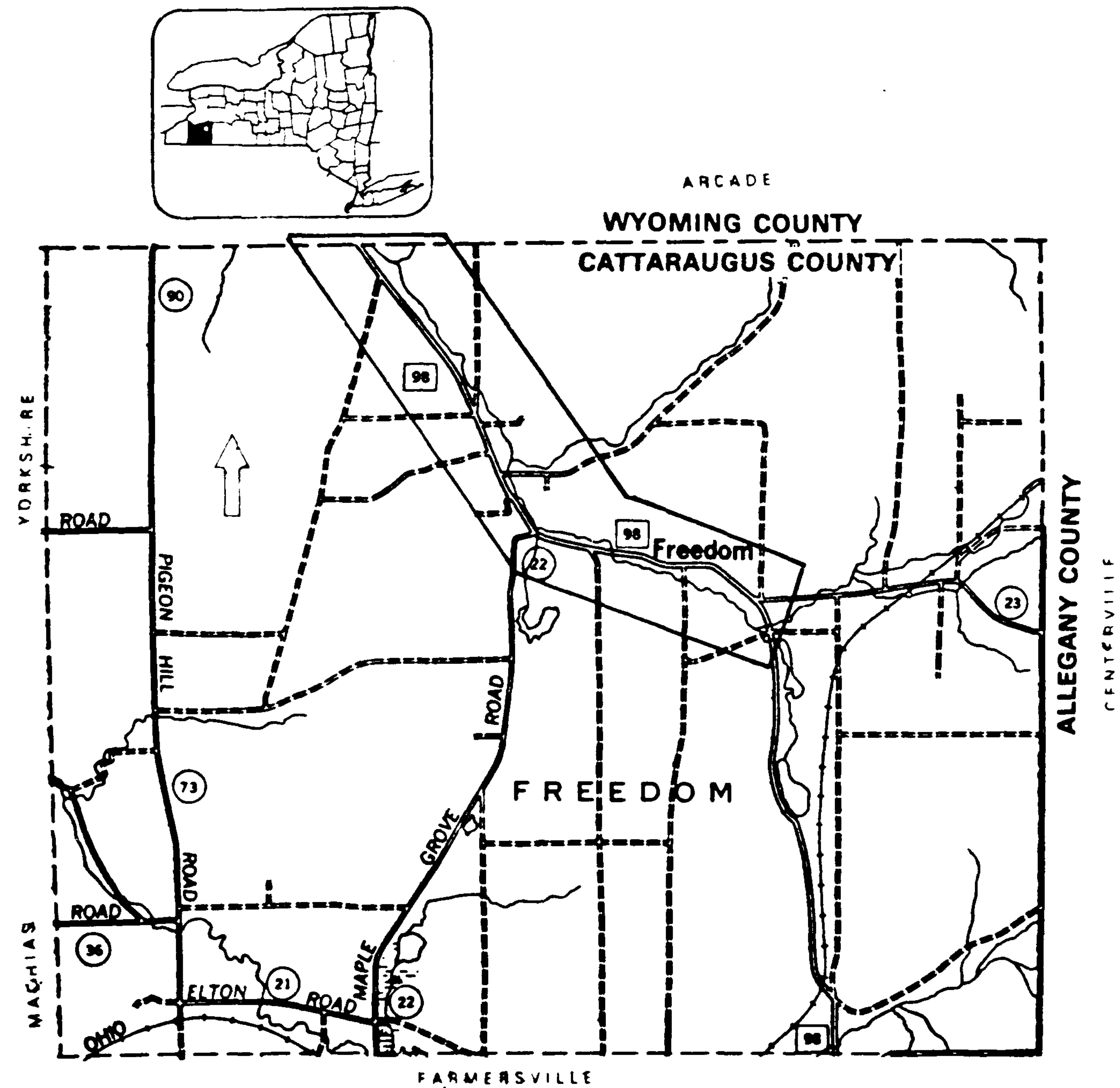
The town of Freedom is located in Cattaraugus County in Western New York, approximately 40 miles southeast of Buffalo. It is bordered by the town of Arcade (Wyoming County) to the north, the town of Centerville (Allegany County) to the east, the town of Farmersville to the south, and the towns of Machias and Yorkshire to the west.

The climate of Freedom is continental, with cold winters and mild summers. The average annual precipitation is 40.98 inches and the average annual temperature is 45°F at the nearest climatological data station (Reference 1.)

Clear Creek originates in the town of Freedom, then flows northwest to the village of Arcade and its confluence with Cattaraugus Creek. The watershed is characterized by relatively steep topography, with little storage. There are several small ponds in the headwaters of the watershed; however, their effect downstream is not significant.

Knowledge of potential floods and flood hazards is important in land use planning. This report identifies the 100-year water surface profile and the associated 100-year flood plain and floodway for Clear Creek within the town of Freedom. The Water Surface Profile on Plates 1-5 shows the 100-year flood elevations. The 100-year flood plain and floodway are shown on the Flooded Area Maps (Plates 6-9).

Information developed during the Clear Creek study will be used by local officials to manage future flood plain development. The town is experiencing development pressure southward along State Route 98. The existing Flood Insurance Rate Map (FIRM) does not have enough detail for the town to adequately manage its flood plain program (Reference 2). In addition, the stream has changed its location in some areas due to meandering. While this report does not provide solutions to flood problems, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development.



CLEAR CREEK VICINITY MAP

Additional copies of this report can be obtained from the New York State Department of Environmental Conservation and the National Technical Information Service of the U.S. Department of Commerce, Springfield, Virginia 22161. The Buffalo District Corps of Engineers will provide technical assistance and guidance to planning agencies in the interpretation and use of the data.

PRINCIPAL FLOOD PROBLEMS

Clear Creek is an ungaged stream. However, local newspaper articles indicate that flooding on Clear Creek occurred in 1902, 1971, 1972, 1984, 1985, and 1986 (Reference 3). Frequency interval for these floods is not known since no data are available. Local officials report that some bridges were destroyed in the 1986 flood.

Flood Magnitudes and Their Frequencies

Floods are classified on the basis of their frequency or recurrence interval. A 100-year flood is an event with a magnitude that can be expected to be equaled or exceeded once on the average during any 100-year period. It has a 1.0 percent chance of occurring in any given year. It is important to note that, while on a long-term basis the exceedence averages out to once per 100 years, floods of this magnitude can occur in any given year or even in consecutive years and within any given time interval. For example, there is a greater than 50 percent probability that a 100-year event will occur during a 70-year lifetime. Additionally, a house which is built within the 100-year flood plain has about a one-in-four chance of being flooded in a 30-year mortgage life.

Hazards and Damages of Large Floods

The extent of damage caused by any flood depends on the topography of the flooded area, the depth and duration of flooding, the velocity of flow, the rate of rise in water surface elevation, and development of the flood plain. Deep water flowing at a high velocity and carrying floating debris would create conditions hazardous to persons and vehicles which attempt to cross the flood plain. Generally, water 3 or more feet deep which flows at a velocity of 3 or more feet per second could easily sweep an adult off his feet and create definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged or floated. Since water lines can be ruptured by deposits of debris and by the force of flood waters, there is the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and flooded sewage treatment plants (if located within the flood boundaries) could result in the pollution of floodwaters and could create health hazards. Areas isolated by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

HYDROLOGIC ANALYSES

Hydrologic analyses were carried out to establish the 100-year peak discharge for Clear Creek. Drainage areas were delineated using U.S. Geological Survey (USGS) 7.5-minute topographic maps (Reference 4). Clear Creek was divided into five reaches to most accurately define the hydrologic and discharge characteristics in the study area. Reach 1 extends from 3,900 feet above its confluence with Cattaraugus Creek (Sta 39+00) and continues

upstream for 4,980 feet to Station 88+80 and is downstream of the study area. Reach 2 extends from station 88+80 which is just north of Bray Road, upstream 11,137 feet to Station 200+17, approximately 0.3 miles south of Eagle Street. Reach 3 extends from Station 200+17 upstream for 3,583 feet to Station 236+00, approximately 0.17 miles east of Maple Grove Road. Reach 4 extends from Station 236+00, 9,461 feet upstream to Station 330+61, approximately .15 miles east of Galen Hill Road. Reach 5 extends from Station 330+61 upstream for 406 feet to Station 334+67 at State Route 98 just north of Moore Road.

The Kinematic Wave Method of the Corps HEC-1 program (Reference 5) was used to determine the 100-year peak discharge on Clear Creek. HEC-1 is a computerized method that has various options to simulate rainfall/runoff processes. The Kinematic Wave Method was applied to determine runoff and to simulate flood routing. The drainage basin of Clear Creek was divided into nine sub-basins. For each sub-basin, the following input data were used: (1) drainage area; (2) curve number; (3) overland flow length; (4) representative sub-basin slope; (5) Manning's "n"; (6) channel length; (7) channel slope; (8) channel roughness; (9) channel shape; (10) channel width; and (11) channel sideslopes. A hypothetical storm was generated to produce the 100-year, 24-hour precipitation.

Table 1 presents the results of the hydrologic analysis for Clear Creek.

Table 1 - Summary of 100-Year Peak Discharges

Stream	Station	Drainage Area (square miles)	100-Year Peak Discharge (cfs)
Clear Creek			
* Reach 1	39+00 - 88+80	32.8	7,000
Reach 2	88+80 - 200+17	26.1	5,300
Reach 3	200+17 - 236+00	17.8	3,300
Reach 4	236+00 - 330+61	12.6	2,500
Reach 5	330+61 - 334+67	9.5	2,100

* Reach is downstream of study area.

HYDRAULIC ANALYSES

Analyses of the hydraulic characteristics of flooding from Clear Creek were carried out to provide estimates of the water surface elevations of a flood with a 100-year recurrence interval.

Cross-section data for the backwater analyses were obtained from field surveys conducted for this study and from USGS topographic maps (Reference 4). All bridges and culverts were surveyed to obtain elevation and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profile and the Flooded Area Maps.

Water surface elevations of the 100-year flood along Clear Creek were computed using the Corps of Engineers HEC-2 step backwater computer program (Reference 6). The starting water surface elevation for Clear Creek was determined using the normal depth method at a cross section located approximately 5,190 feet downstream of the Bray Road bridge.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgement and based on field observations of the stream and floodplain areas. The channel "n" values ranged from 0.035 to 0.060, and overbank values, from 0.050 to 0.100. Contraction and expansion coefficients ranged from 0.1 to 0.3 for contraction and 0.3 to 0.5 for expansion of flows.

The computed 100-year water surface profile for Clear Creek is shown on Plates 1 to 5. The flood plain boundaries are shown on Plates 6 to 9. These boundaries were delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using USGS topographic maps and spot elevations obtained during the field surveys. Small areas within the flood plain boundaries may be above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

An encroachment floodway was also determined for Clear Creek based on equal conveyance reduction from each side of the flood plain. At the request of the New York State Department of Environmental Conservation, the maximum increase in stage was limited to 1 foot, provided that hazardous velocities were not produced. Floodway widths were computed at each cross section. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2. The computed floodway is also shown on the Flooded Area Maps, Plates 6 to 9. In cases where the floodway and the 100-year flood plain boundary are either close together or collinear, only the floodway is shown.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations presented in this study are considered valid only if hydraulic structures remain clear, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. Elevation reference marks used in this study are shown on Plates 6 to 9. The descriptions of these reference marks are presented in Table 3.

UNIFIED FLOOD PLAIN MANAGEMENT

Historically, the alleviation of flood damage has been accomplished almost exclusively by the construction of protective works such as reservoirs, channel improvements, and floodwalls and levees. However, in spite of the billions of dollars that have already been spent for construction of well-designed and efficient flood control works, annual flood damages continue to increase because the number of persons and structures occupying floodprone lands is increasing faster than protective works can be provided.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
A	9,900	450	1,113	4.8		1534.7	1534.8	.1
B	11,800	354	800	6.6		1549.1	1549.2	.1
C	14,110	380	1,586	3.3		1573.0	1573.5	.5
D	16,653	521	973	5.4		1591.3	1591.3	.0
E	18,620	400	1,094	4.8		1609.2	1609.2	.0
F	20,167	83	295	11.2		1623.6	1623.6	.0
G	22,560	74	384	8.6		1646.5	1646.5	.0
H	25,210	140	533	4.7		1677.4	1677.5	.1
I	26,715	69	258	9.7		1694.3	1694.3	.0
J	28,820	234	479	5.2		1718.9	1718.9	.0
K	31,710	180	594	4.2		1744.7	1744.8	.1
L	33,227	189	400	5.2		1756.5	1756.6	.1

1. Distance is measured in feet from confluence with Cattaraugus Creek.

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY TOWN OF FREEDOM, NEW YORK CATTARAUGUS COUNTY	FLOODWAY DATA CLEAR CREEK

Table 3 - Elevation Reference Marks

Reference Mark	Elevation (feet NGVD)	Description of Location
RM 1	1535.83	Chiseled square on west abutment, downstream side of Bray Road bridge over Clear Creek.
RM 2	1559.54	Standard disk, stamped "M 85 1935," adjusted 1949, in top of west end of north abutment at culvert, 12 feet west of State Route 98, and about level with highway, approximately .27 miles south of Brown School House Road.
RM 3	1589.48	Yellow mark on steel plate of low steel on upstream side at center of Sparks Road bridge over Clear Creek.
RM 4	1608.17	Top of I-beam on upstream face along west side of Jones Road bridge over Clear Creek.
RM 5	1630.20	Nail in telephone pole "NY 2" along west bank of Clear Creek, approximately 25 feet upstream of Eagle Street bridge in Sandusky.
RM 6	1657.13	Standard disk, stamped "N 85 1935," in top of concrete post, 25 feet west of centerline of State Route 98, about 60 feet south of Small Creek, approximately 50 feet south of Maple Grove Road along State Route 98.
RM 7	1698.40	Chiseled square on east abutment, upstream side of State Route 98 bridge over Clear Creek, approximately 1.09 miles south of Eagle Street along State Route 98.
RM 8	1713.95	Nail in telephone pole, southwest side of State Route 98, northeast of Gravel Road in front of FF&S Gun Club building, approximately 1.33 miles south of Eagle Street along State Route 98.
RM 9	1719.58	Nail in telephone pole 169, north side of State Route 98, west of intersection of Galen Hill Road and State Route 98.
RM 10	1767.84	Chiseled square on upstream face of south abutment of State Route 98 bridge over Clear Creek, approximately 225 feet north of Moore Road on East Side Road.

Recognition of this trend has forced a reassessment of the flood control concept and resulted in the broadened concept of unified flood plain management programs. Legislative and administrative policies frequently cite two approaches: structural and nonstructural, for adjusting to the flood hazard. In this context, "structural" is usually intended to mean adjustments that modify the behavior of floodwaters through the use of measures such as dams and channel work. "Nonstructural" is usually intended to include all other adjustments in the way society acts when occupying or modifying a flood plain (e.g., regulations, floodproofing, insurance, etc.). Both structural and nonstructural tools are used for achieving desired future flood plain conditions. There are three basic strategies which may be applied individually or in combination: (1) modifying the susceptibility to flood damage and disruption, (2) modifying the floods themselves, and (3) modifying (reducing) the adverse impacts of floods on the individual and the community.

Modify Susceptibility to Flood Damage and Disruption

The strategy to modify susceptibility to flood damage and disruption consists of actions to avoid dangerous, economically undesirable, or unwise use of the flood plain. Responsibility for implementing such actions rests largely with the non-Federal sector and primarily at the local level of Government.

These actions include restrictions in the mode and the time of occupancy; in the ways and means of access; in the pattern, density, and elevation of structures and in the character of their materials (structural strength, absorptiveness, solubility, corrodibility); in the shape and type of buildings and in their contents; and in the appurtenant facilities and landscaping of the grounds. The strategy may also necessitate changes in the interdependencies between flood plains and surrounding areas not subject to flooding, especially interdependencies regarding utilities and commerce. Implementing mechanisms for these actions include land use regulations, development and redevelopment policies, floodproofing, disaster preparedness and response plans, and flood forecasting and warning systems. Different methods may be more suitable for developed or underdeveloped flood plains or to urban or rural areas. The information contained in this report is particularly useful for the preparation of flood plain regulations.

a. Flood Plain Regulations.

Flood plain regulations apply to the full range of ordinances and other means designed to control land use and construction within floodprone areas. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment line statutes, open area regulations, and other similar methods of management which affect the use and development of floodprone areas.

Flood plain land use management does not prohibit use of floodprone areas; to the contrary, flood plain land use management seeks the best use of flood plain lands. The flooded area map and the water surface profile contained in this report can be used to guide development in the flood plain. The elevations shown on the profile should be used to determine flood heights because they are

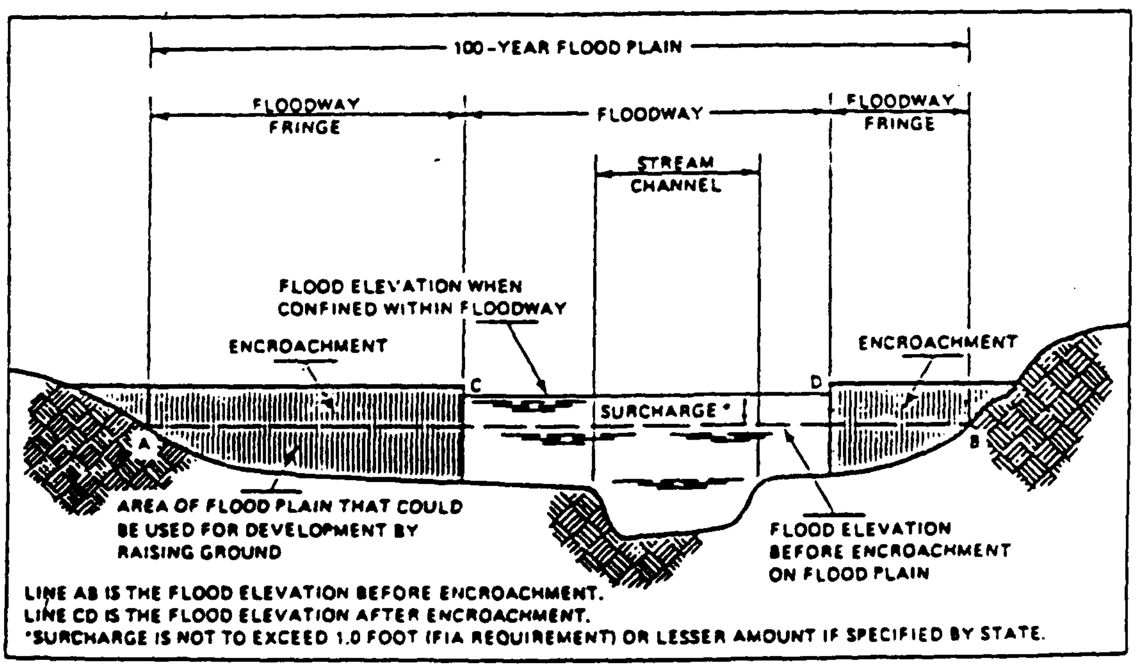
more accurate than the outlines of flooded areas. It is recommended that development in areas susceptible to frequent flooding adhere to the principles expressed in Executive Order 11988 - Flood Plain Management, whose objective is to "...avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains ... wherever there is a practicable alternative." Accordingly, development in areas susceptible to frequent flooding should consist of construction which has a low damage potential such as parking areas and golf courses. High value construction such as buildings should be located outside the flood plain to the fullest extent possible. In instances where no practicable alternative exists, the land should be elevated to minimize damages. If it is uneconomical to elevate the land in these areas, means of floodproofing the structures should be given careful consideration.

b. Development Zones.

A flood plain consists of two useful zones. The first zone is the designated "floodway" or that cross sectional area required for carrying or discharging the anticipated flood waters with a maximum 1-foot increase in flood level (New York State Department of Environmental Conservation standard). Velocities are the greatest and most damaging in the floodway. Regulations essentially maintain the flow-conveying capability of the floodway to minimize inundation of additional adjacent areas. Uses which are acceptable for floodways include parks, parking areas, open spaces, etc.

The second zone of the flood plain is termed the "floodway fringe" or restrictive zone, in which inundation might occur but where depths and velocities are generally low. Although not recommended if practicable alternatives exist, such areas can be developed if structures are placed high enough or floodproofed to be reasonably free from flood damage during the 100-year flood. Typical relationships between the floodway and floodway fringe are shown in Figure 1. The floodway for Clear Creek has been plotted on the Flooded Area Maps, Plates 6 to 9.

Figure 1 - Floodway Schematic



c. Formulation of Flood Plain Regulations

Formulation of flood plain regulations in a simplified sense involves selecting the type and degree of control to be exercised for each specific flood plain. In principle, the form of the regulations is not as important as a maintained adequacy of control. The degree of control normally varies with the flood hazard as measured by depth of inundation, velocity of flow, frequency of flooding, and the need for available land. Considerable planning and research is required for the proper formulation of flood plain regulations. Where formulation of flood plain regulations is envisioned to require a lengthy period of time during which development is likely to occur, temporary regulations should be adopted to be amended later as necessary.

Modify Flooding

The traditional strategy of modifying floods through the construction of dams, dikes, levees and floodwalls, channel alterations, high flow diversions and spillways, and land treatment measures has repeatedly demonstrated its effectiveness for protecting property and saving lives, and it will continue to be a strategy of flood plain management. However, in the future, reliance solely upon a flood modification strategy is neither possible nor desirable. Although the large capital investment required by flood modifying tools has been provided largely by the Federal Government, sufficient funds from Federal sources have not been and are not likely to be available to meet all situations for which flood modifying measures would be both effective and economically feasible. Another consideration is that the cost of maintaining and operating flood control structures falls upon local governments.

Flood modifications acting alone leave a residual flood loss potential and can encourage an unwarranted sense of security leading to inappropriate use of lands in the areas that are directly protected or in adjacent areas. For this reason, measures to modify possible floods should usually be accompanied by measures to modify the susceptibility to flood damage, particularly by land use regulations.

Modify the Impact of Flooding on Individuals and the Community

A third strategy for mitigating flood losses consists of actions designed to assist individuals and communities in their preparatory, survival, and recovery responses to floods. Tools include information dissemination and education, arrangements for spreading the costs of the loss over time, purposeful transfer of some of the individual's loss to the community by reducing taxes in floodprone areas, and the purchase of Federally subsidized flood insurance.

The distinction between a reasonable and unreasonable transfer of costs from the individual to the community can also be regulated and is a key to effective flood plain management.

CONCLUSION

This report presents flood hazard information for Clear Creek within the town of Freedom, New York. The U.S. Army Corps of Engineers, Buffalo District, will provide interpretation in the application of the data contained in this report, particularly as to its use in developing effective flood plain regulations. Requests should be coordinated with the New York State Department of Environmental Conservation.

GLOSSARY

BACKWATER	The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.
BASE FLOOD	A flood which has an average return interval in the order of once in 100 years, although the flood may occur in any year. It is based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed. It is commonly referred to as the "100-year flood."
DISCHARGE	The quantity of flow in a stream at any given time, usually measured in cubic feet per second (cfs).
FLOOD	An overflow of lands not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary and the lands are adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water. Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, and rise of groundwater coincident with increased streamflow.
FLOOD CREST	The maximum stage or elevation reached by floodwaters at a given location.
FLOOD FREQUENCY	A statistical expression of the percent chance of exceeding a discharge of a given magnitude in any given year. For example, a 100-year flood has a magnitude expected to be exceeded on the average of once every hundred years. Such a flood has a 1 percent chance of being exceeded in any given year. Often used interchangeably with RECURRENCE INTERVAL.
FLOOD PLAIN	The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

FLOOD PROFILE — A graph showing the relationship of water surface elevation to location; the latter generally expressed as distance upstream from a known point along the approximate centerline of a stream of water that flows in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

FLOOD STAGE — The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

FLOODWAY — The channel of a watercourse and those portions of the adjoining flood plain required to provide for the passage of the selected flood (normally the 100-year flood) with an insignificant increase in the flood levels above that of natural conditions. As used in the National Flood Insurance Program, floodways must be large enough to pass the 100-year flood without causing an increase in elevation of more than a specified amount (1 foot in most areas).

RECURRENCE INTERVAL — A statistical expression of the average time between floods exceeding a given magnitude (see FLOOD FREQUENCY).

REFERENCES

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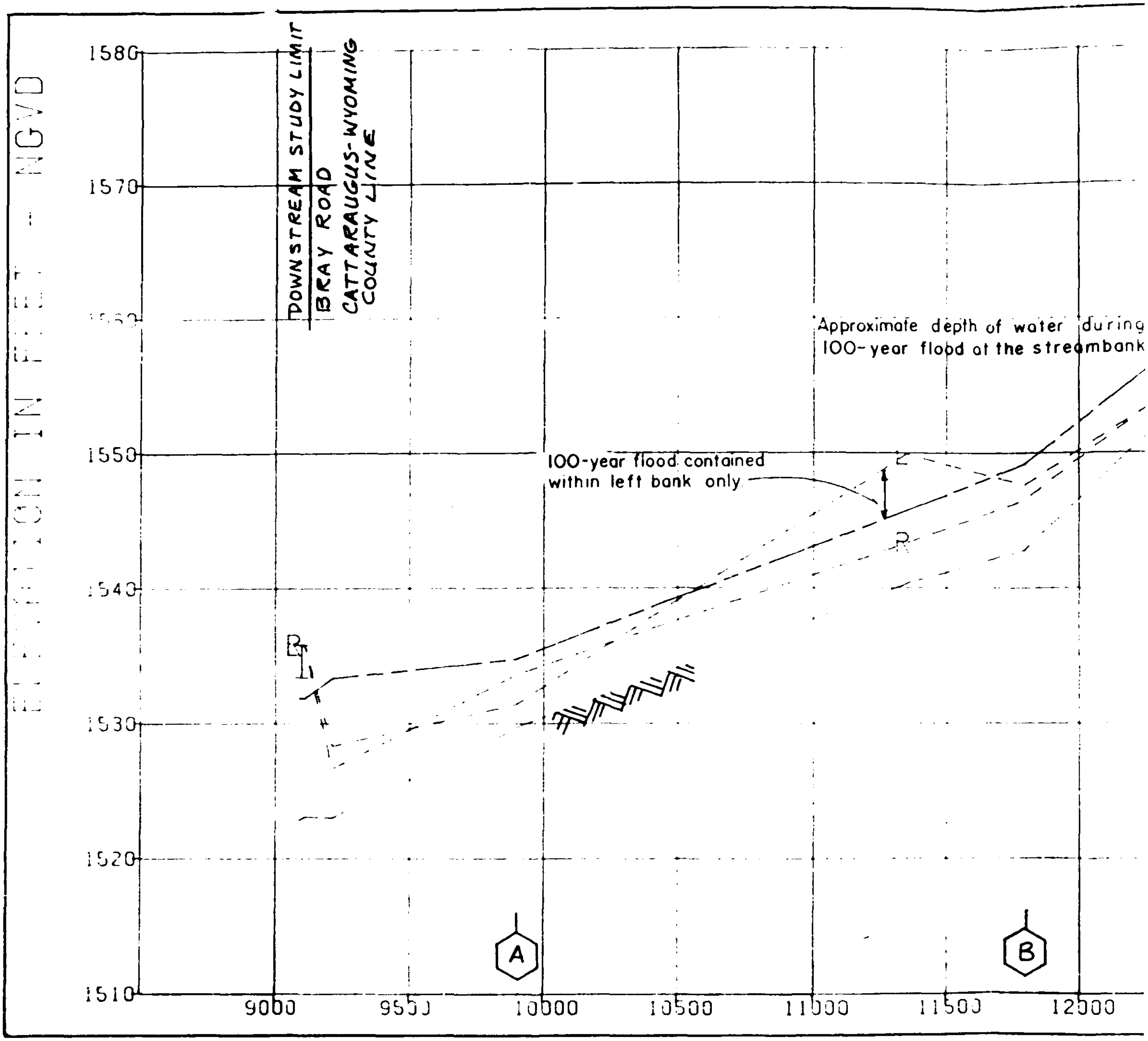
2. Federal Emergency Management Agency, Flood Insurance Rate Map, Town of Freedom, Cattaraugus County, New York, May 1984.

3. Arcade Herald, Thursday, June 21, 1984; Thursday, June 19, 1986; Arcade, New York.

4. U.S. Geological Survey; 7.5 Minute Series Topographic Maps; Scale 1:24000; Arcade, New York, Contour Interval 10 feet, photorevised 1979; Bliss, New York Contour Interval 10 feet, photorevised 1979; Delevan, New York, Contour Interval 20 feet, photorevised 1979; Freedom, New York, Contour Interval 20 feet, 1963.

5. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Davis, California, revised January 1985.

6. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles Generalized Computer Program, Davis, California, 1974.



LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

CROSS SECTION LOCATION

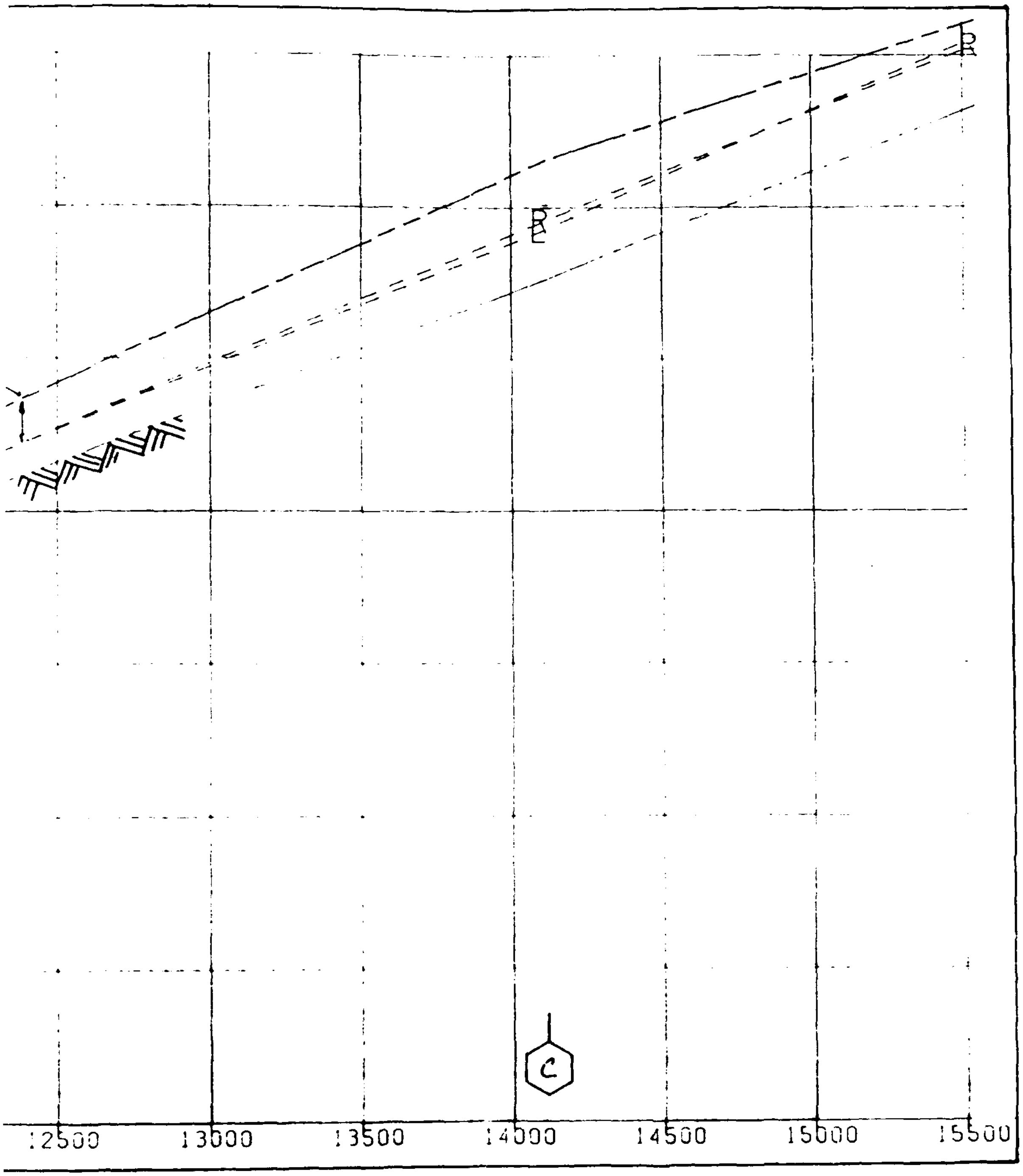
BRIDGE

RIGHT TOP OF BANK

LEFT TOP OF BANK

NOTE: DISTANCE IS MEASURED IN
CONFLUENCE WITH CATTAR

A



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GUS CREEK.

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE I DECEMBER 1989

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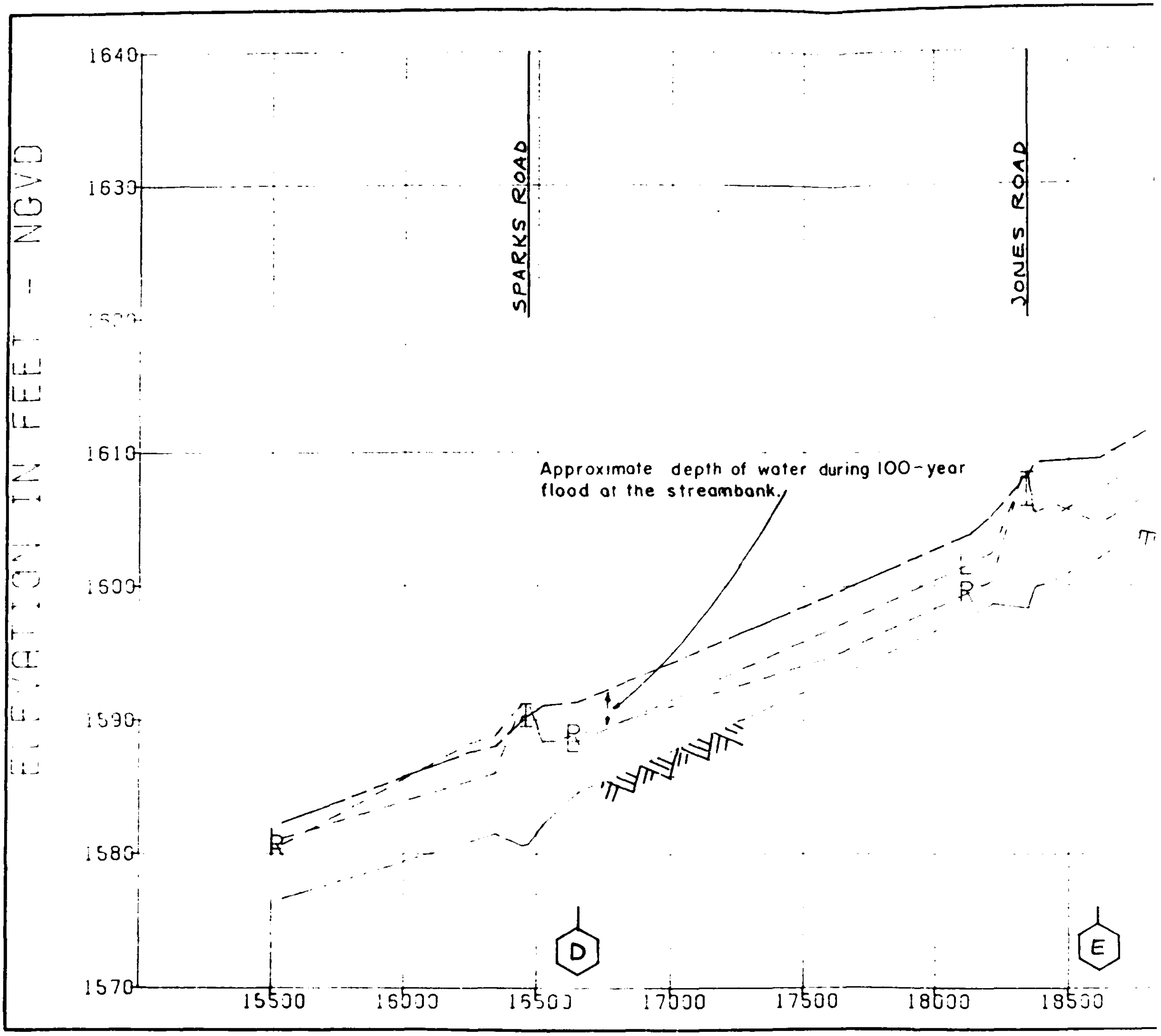

LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

CROSS SECTION LOCATION

BRIDGE

RIGHT TOP OF BANK

LEFT TOP OF BANK

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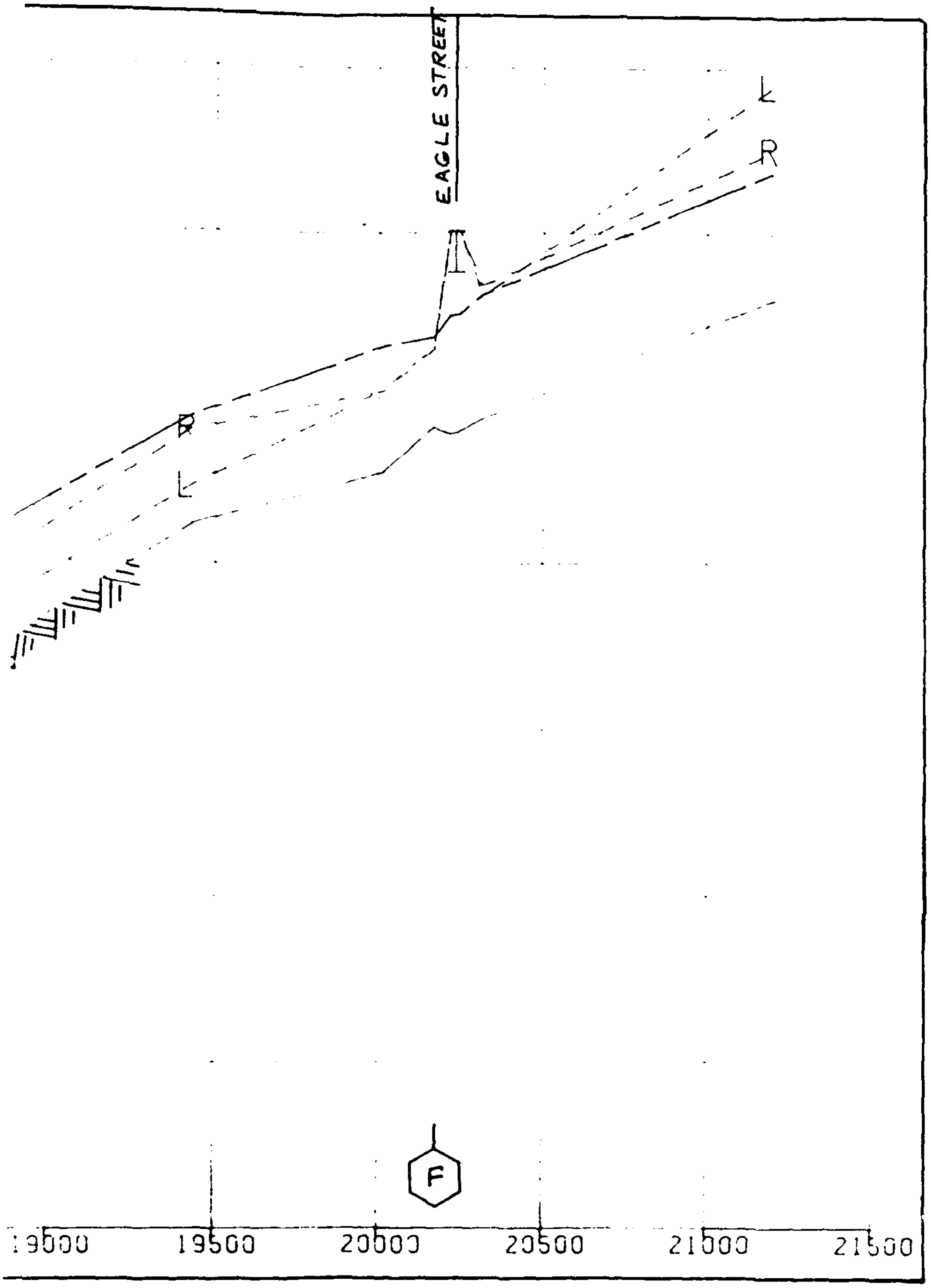
CONFLUENCE WITH CATTARAU

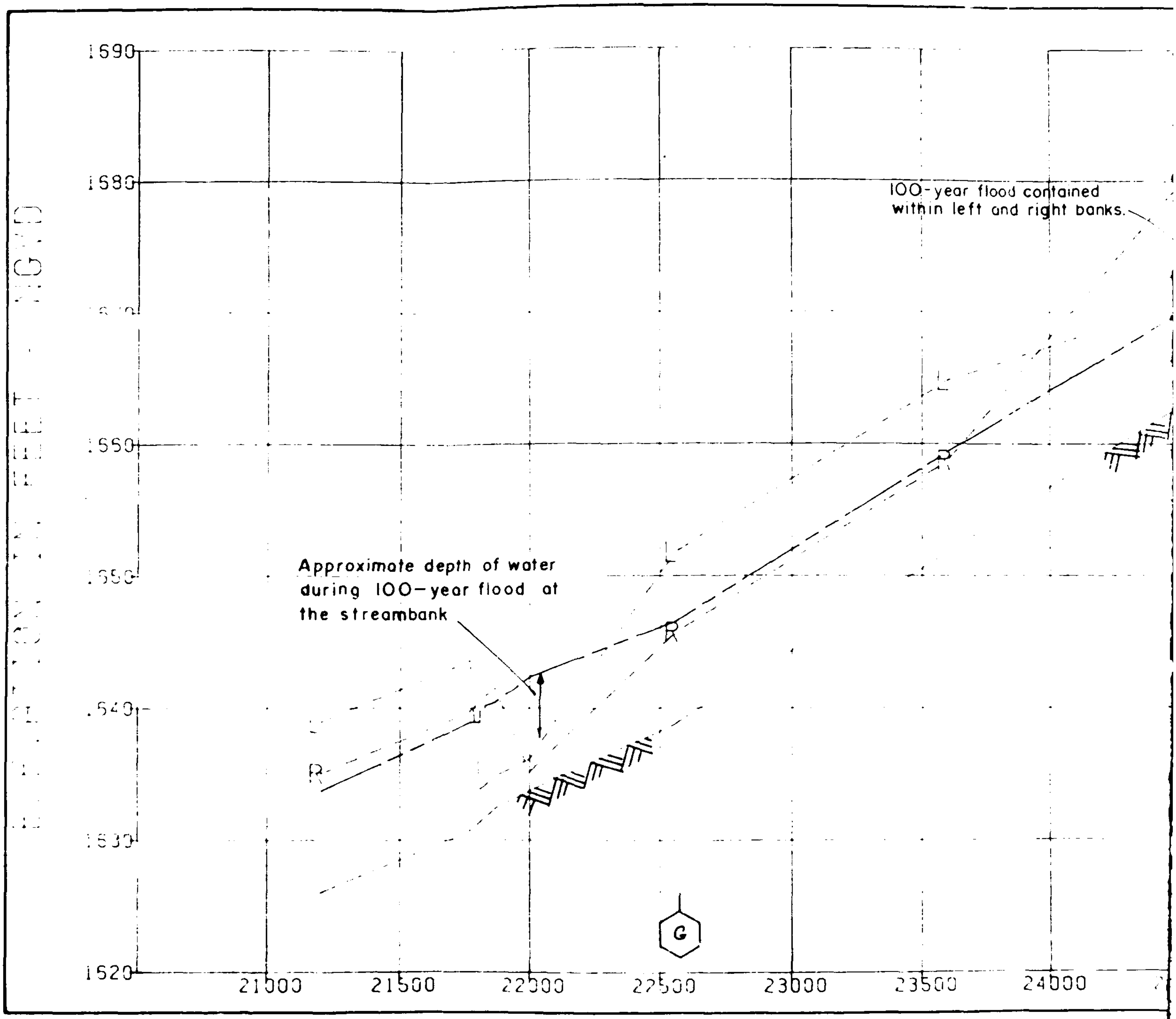


ET FROM
US CREEK.

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 2 DECEMBER 1989



LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

A CROSS SECTION LOCATION

BRIDGE

R R RIGHT TOP OF BANK

L L LEFT TOP OF BANK

NOTE: DISTANCE IS MEASURED IN FEET FROM CONFLUENCE WITH CATTARAUGUS CREEK.

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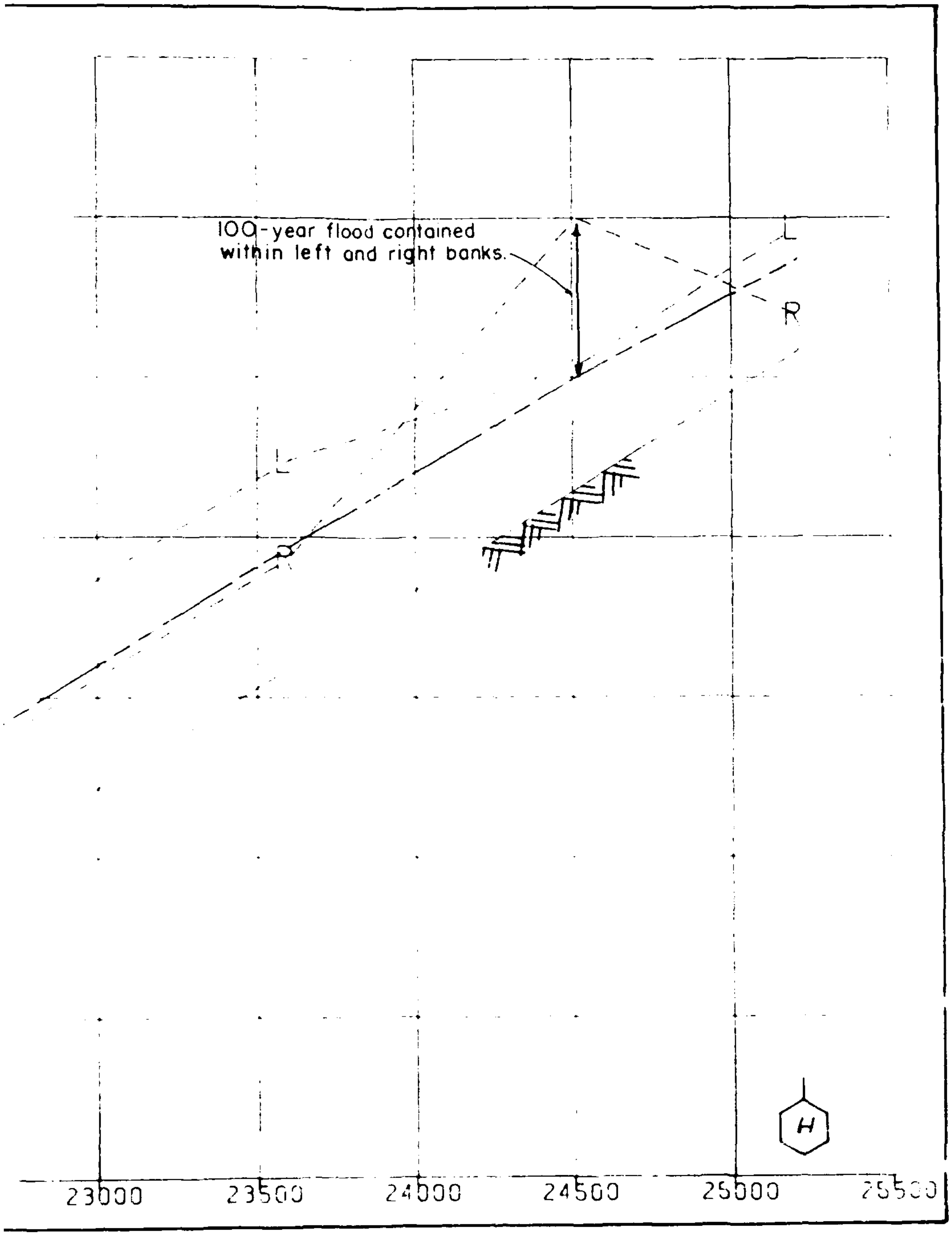

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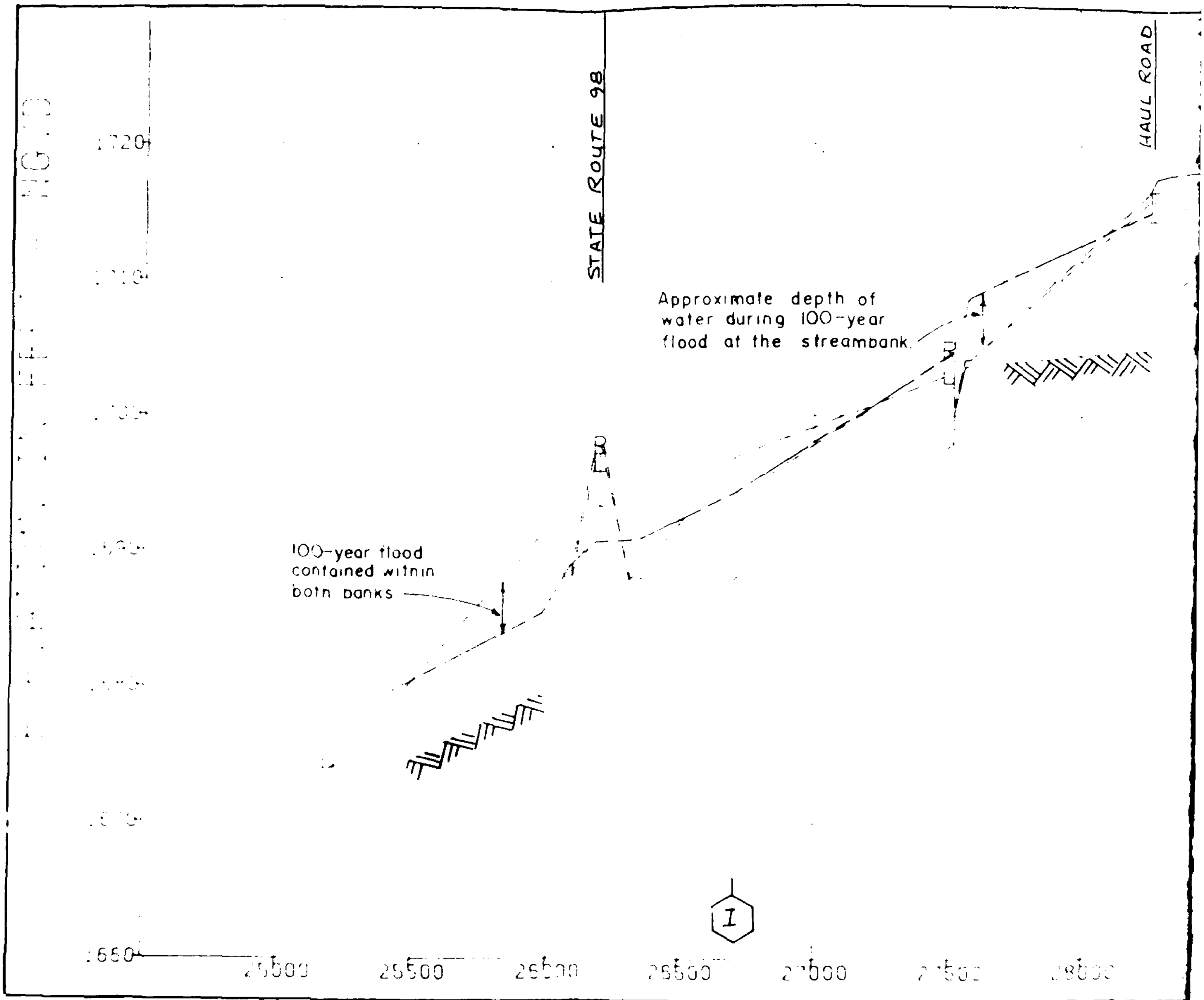
M CONFLUENCE WITH
TARAUGUS CREEK.

U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 3 DECEMBER 1989



LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

(A) CROSS SECTION LOCATION

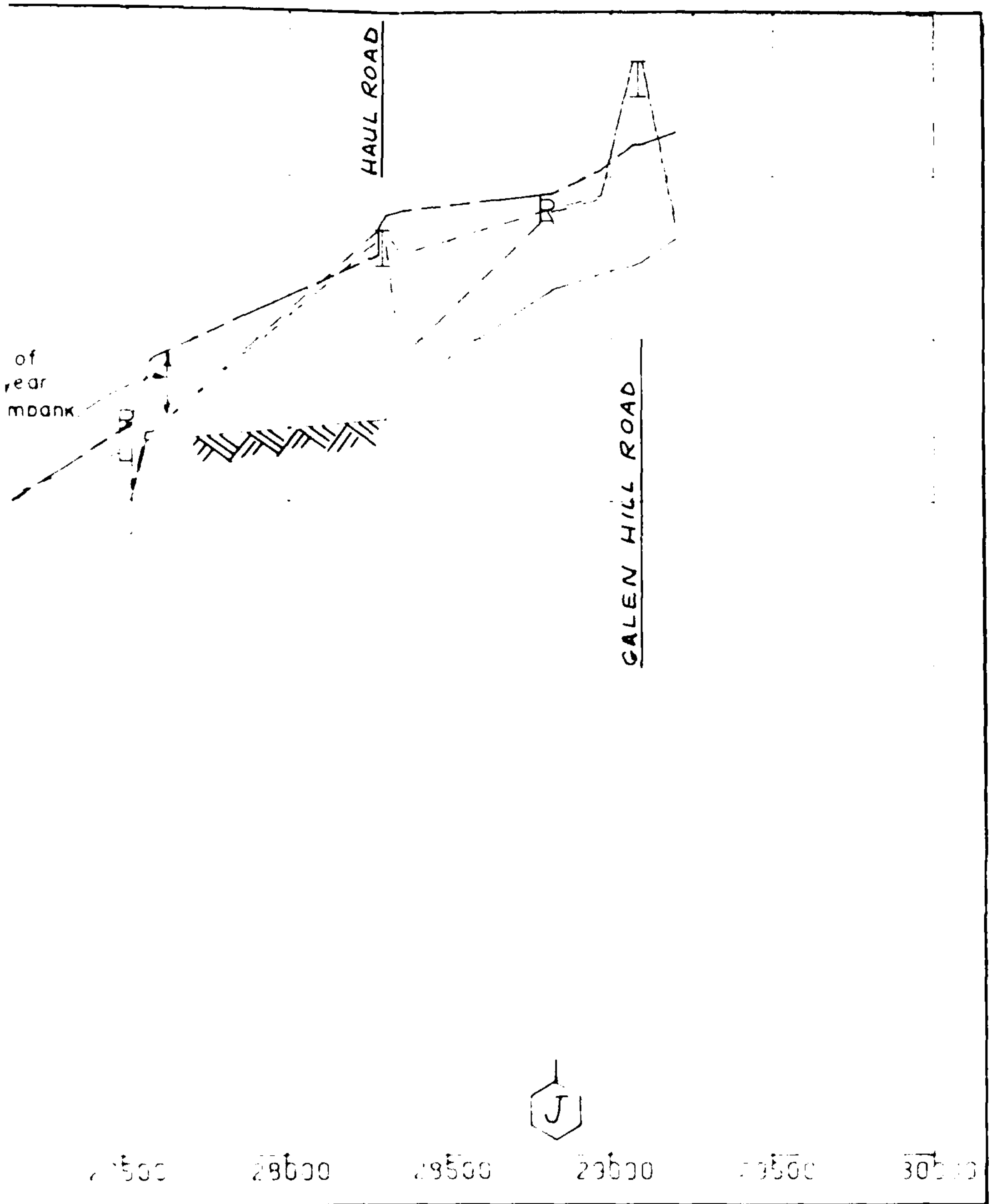
BRIDGE

R R RIGHT TOP OF BANK

L L LEFT TOP OF BANK

NOTE: DISTANCE IS MEASURED IN FEET FROM CONFLUENCE WITH CATTARAUGUS CREEK

P

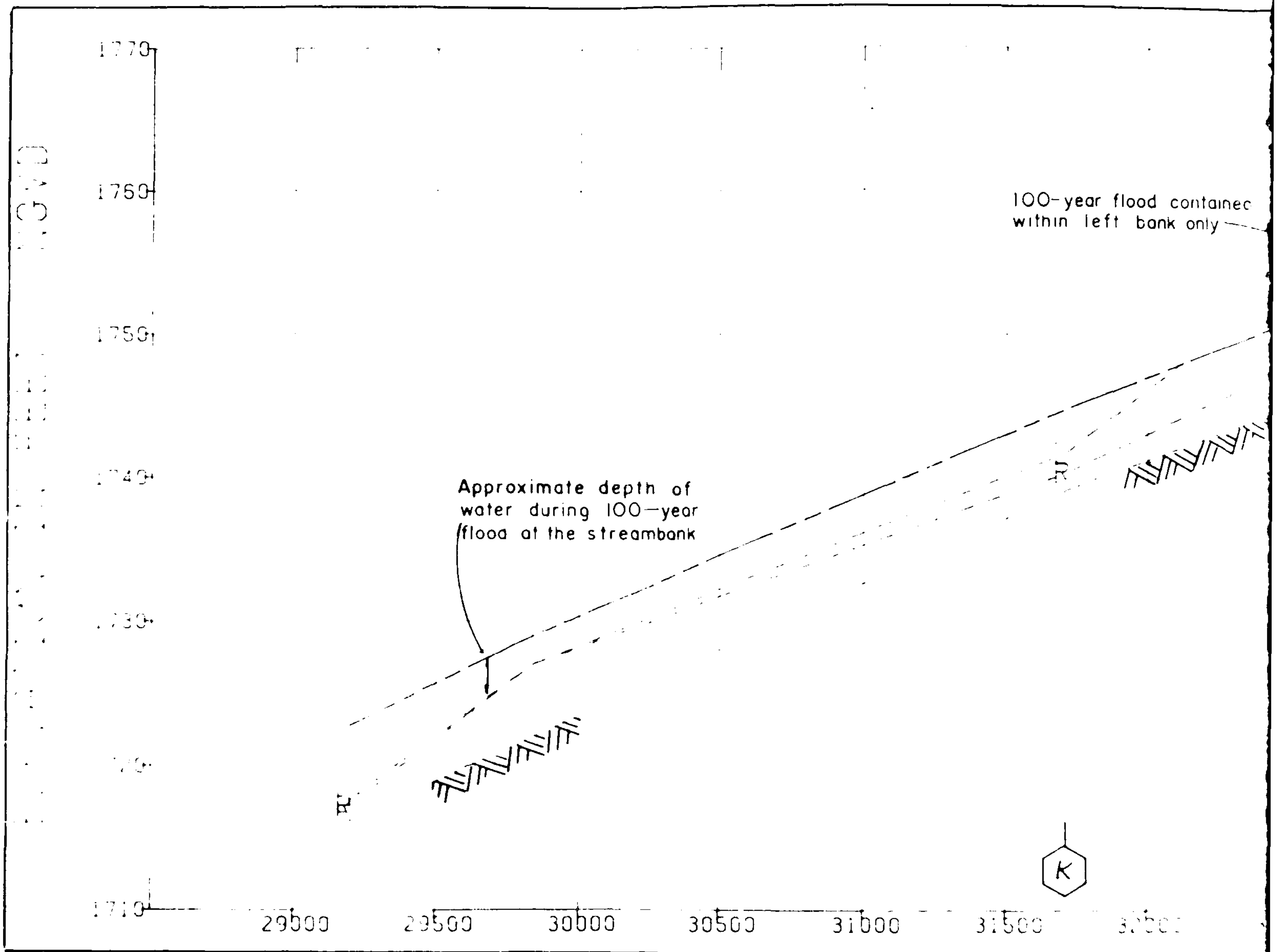


MEASURED IN FEET FROM
WITH CATTARAUGUS CREEK.

U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 4 DECEMBER 1989



LEGEND

100-YEAR FLOOD

CHANNEL BOTTOM

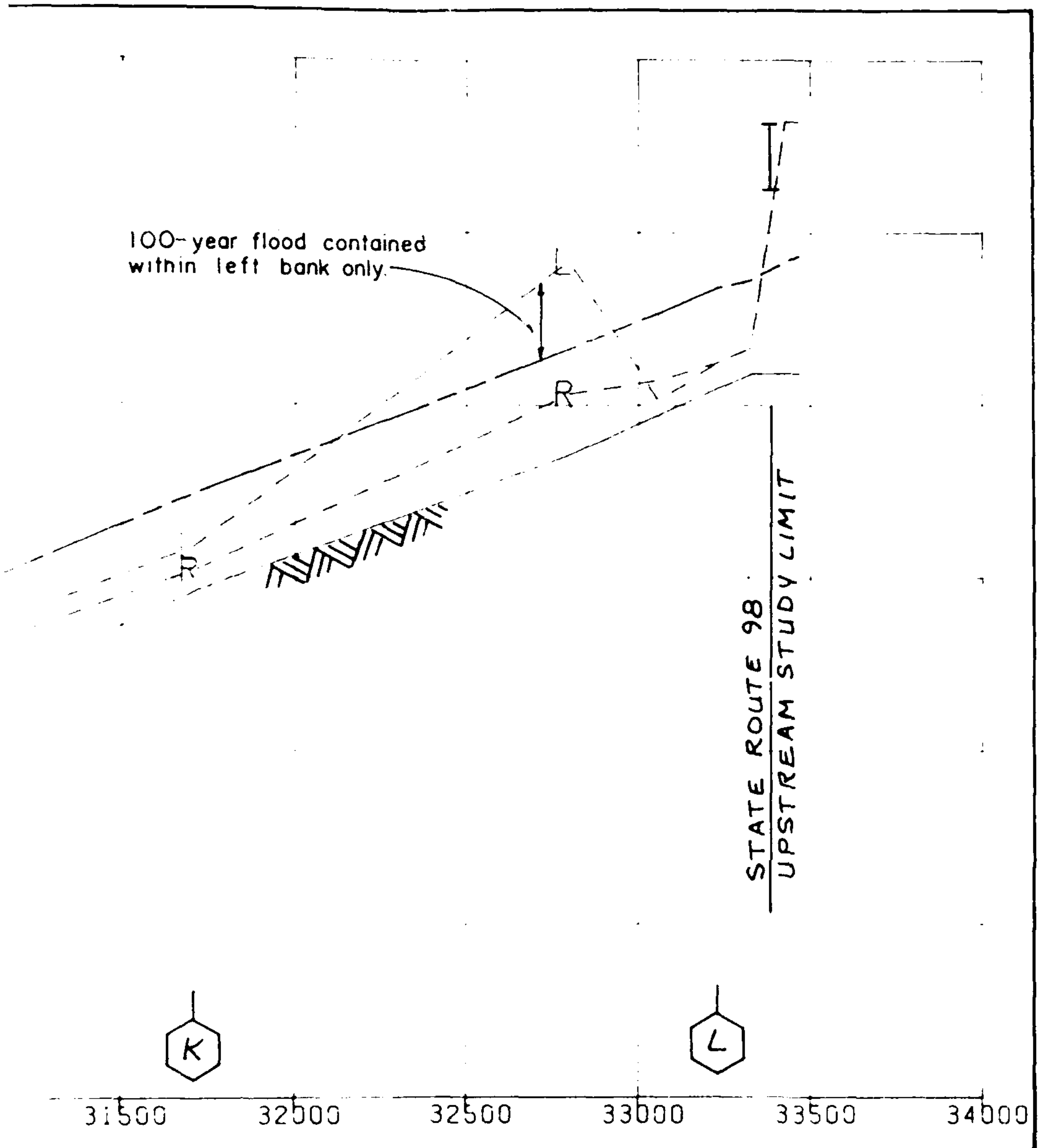
CROSS SECTION LOCATION

BRIDGE

RIGHT TOP OF BANK

LEFT TOP OF BANK

NOTE: DISTANCE IS MEASURED IN FEET FROM CONFLUENCE WITH CATTARAUGUS CREEK.

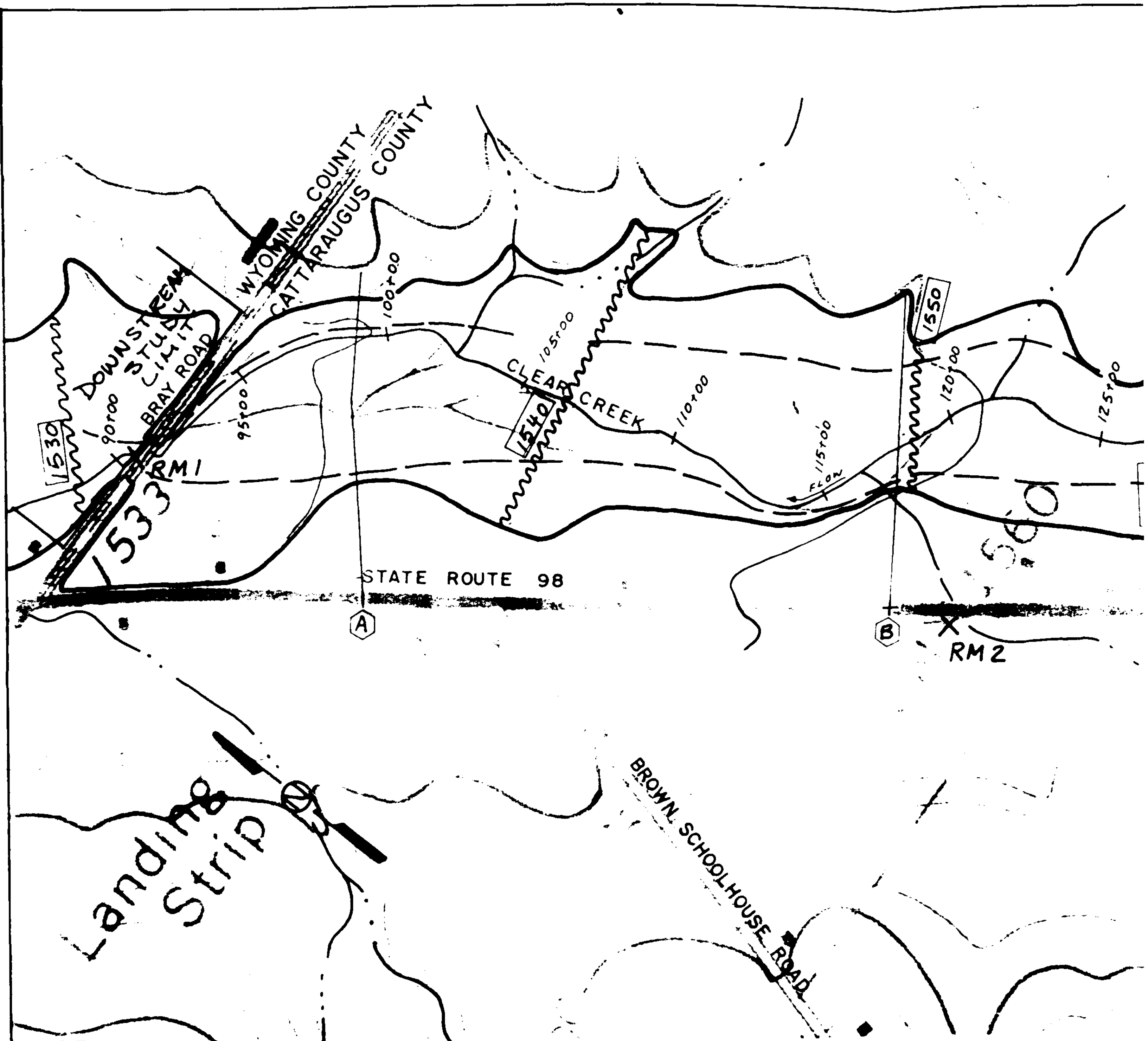


MEASURED IN FEET FROM
WITH CATTARAUGUS CREEK.

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOOD PROFILE
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 5 DECEMBER 1989



LEGEND:

100-YEAR FLOOD PLAIN BOUNDARY

FLOODWAY BOUNDARY

(A)——(A) CROSS SECTION

1550 BASE FLOOD ELEVATIONS

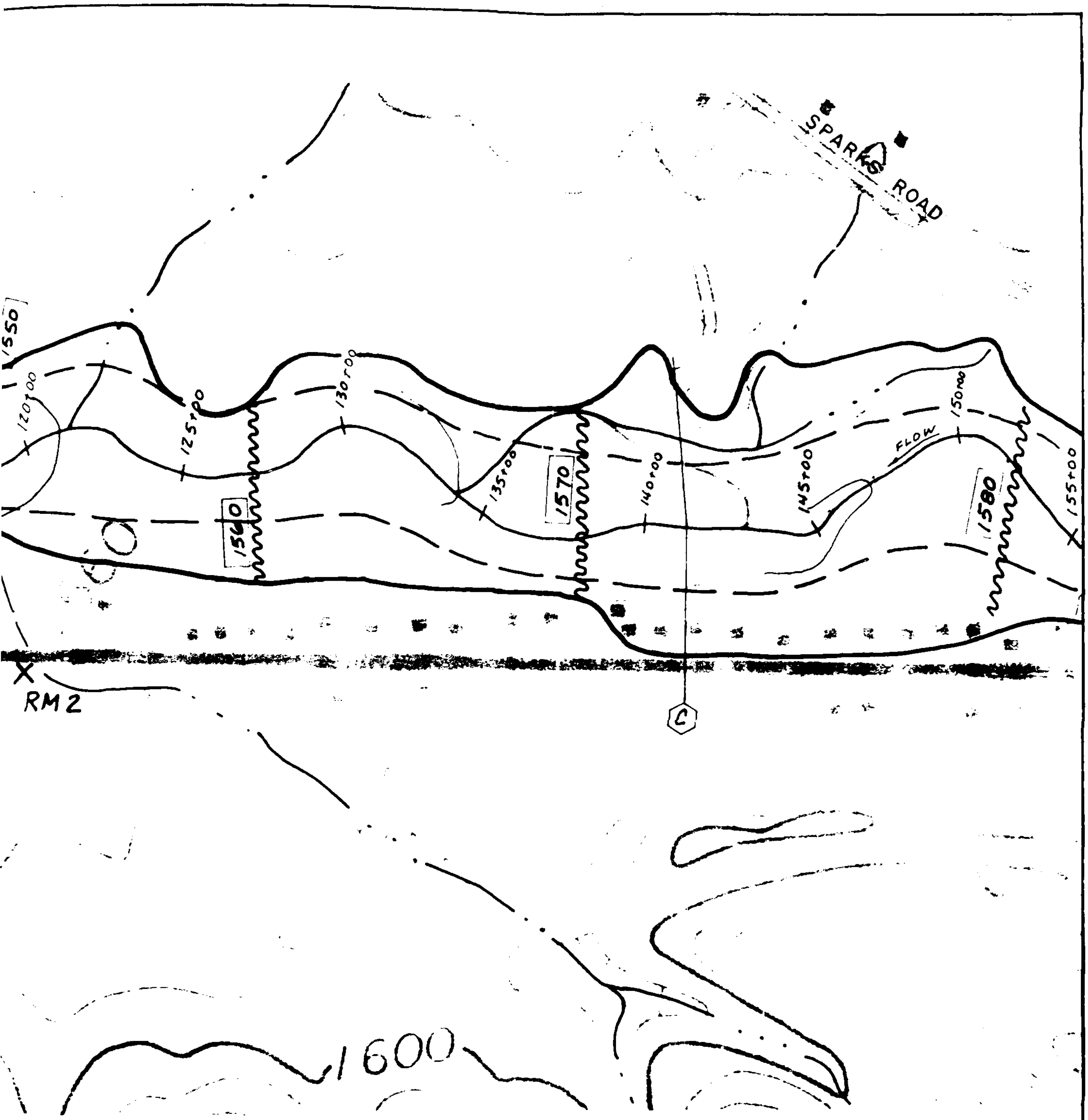
RM1 X ELEVATION REFERENCE MARKS

NOTE: DISTANCE IS MEASU
CONFLUENCE WITH C

SCALE IN F

400 0

A



MATCH WITH PLATE 7

DISTANCE IS MEASURED IN FEET FROM CONFLUENCE WITH CATTARAUGUS CREEK.

SCALE IN FEET

400 0 400

U. S. Army Engineer District, Buffalo

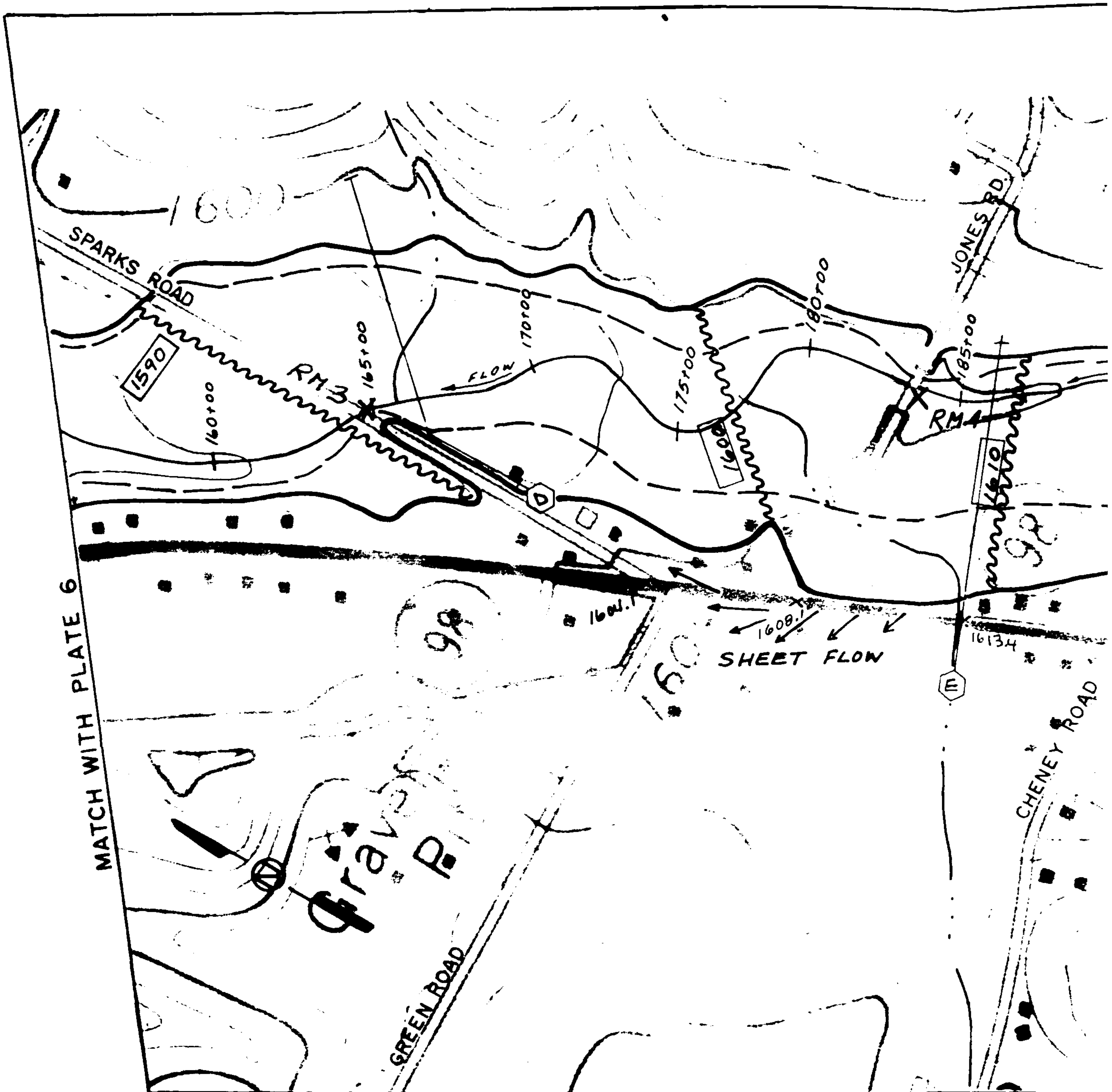
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREAS

CLEAR CREEK

TOWN OF FREEDOM, N.Y.

PLATE 6 AUGUST 1989



LEGEND:

100-YEAR FLOOD PLAIN BOUNDARY

FLOODWAY BOUNDARY

(E)——(E) CROSS SECTION

1620 BASE FLOOD ELEVATIONS

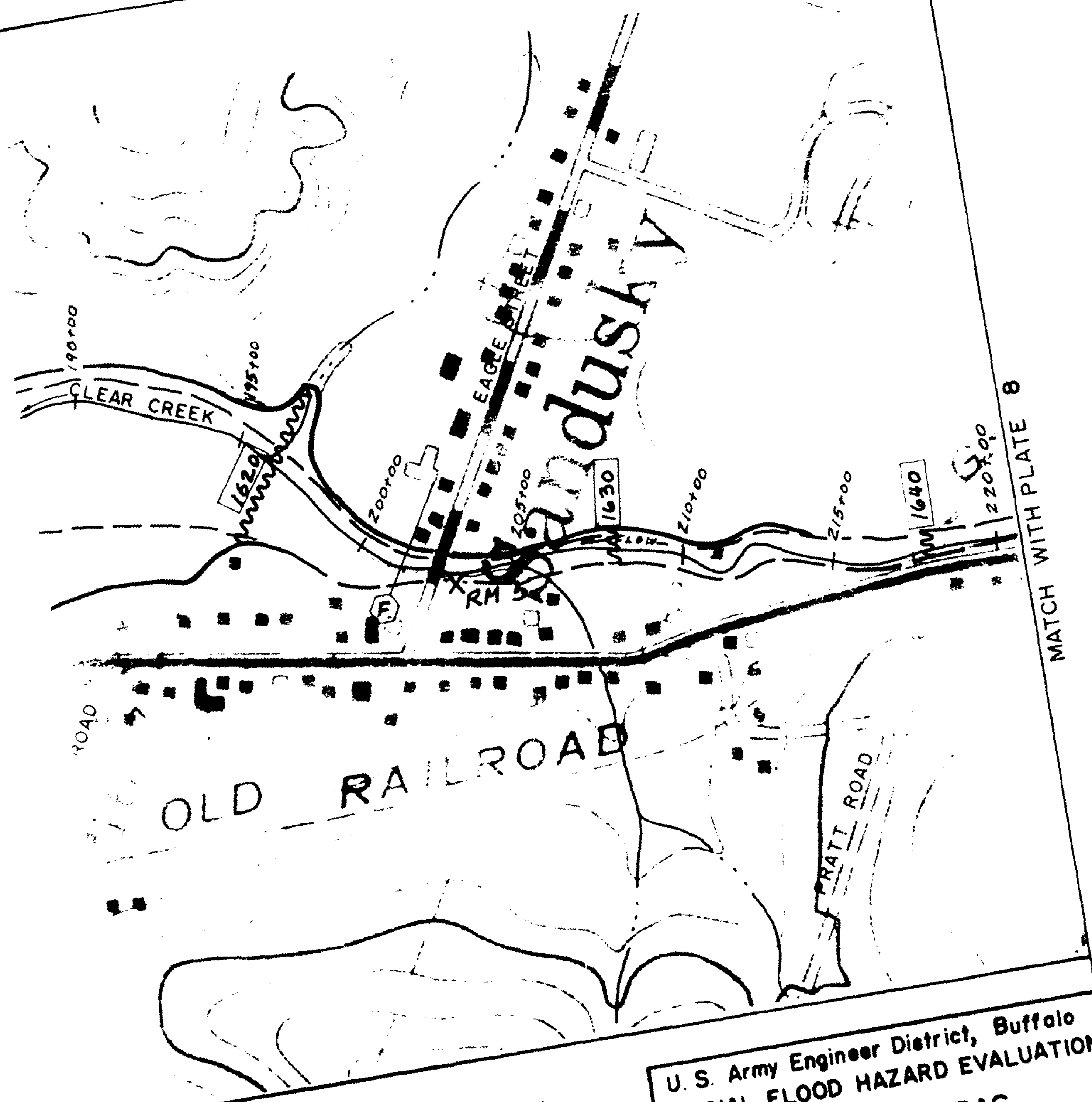
RM1 X ELEVATION REFERENCE MARKS

NOTE: DISTAN
CONFLU

S

400

A



TANCE IS MEASURED IN FEET FROM
IFLUENCE WITH CATTARAUGUS CREEK.

SCALE IN FEET

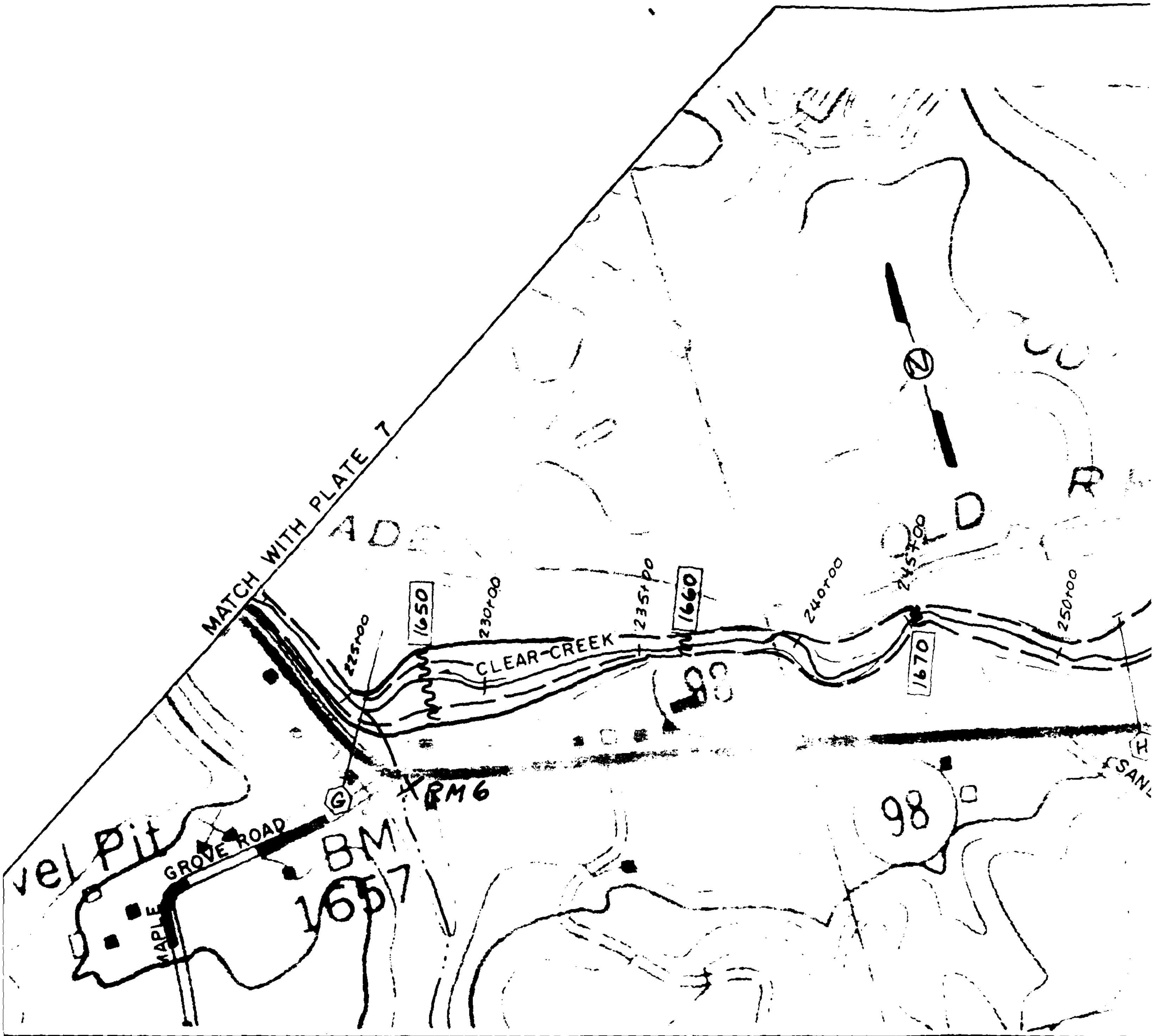
0 400

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREAS
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 7

AUGUST 1989



LEGEND:

100-YEAR FLOOD PLAIN BOUNDARY

FLOODWAY BOUNDARY

(H)——(H) CROSS SECTION

1670 BASE FLOOD ELEVATIONS

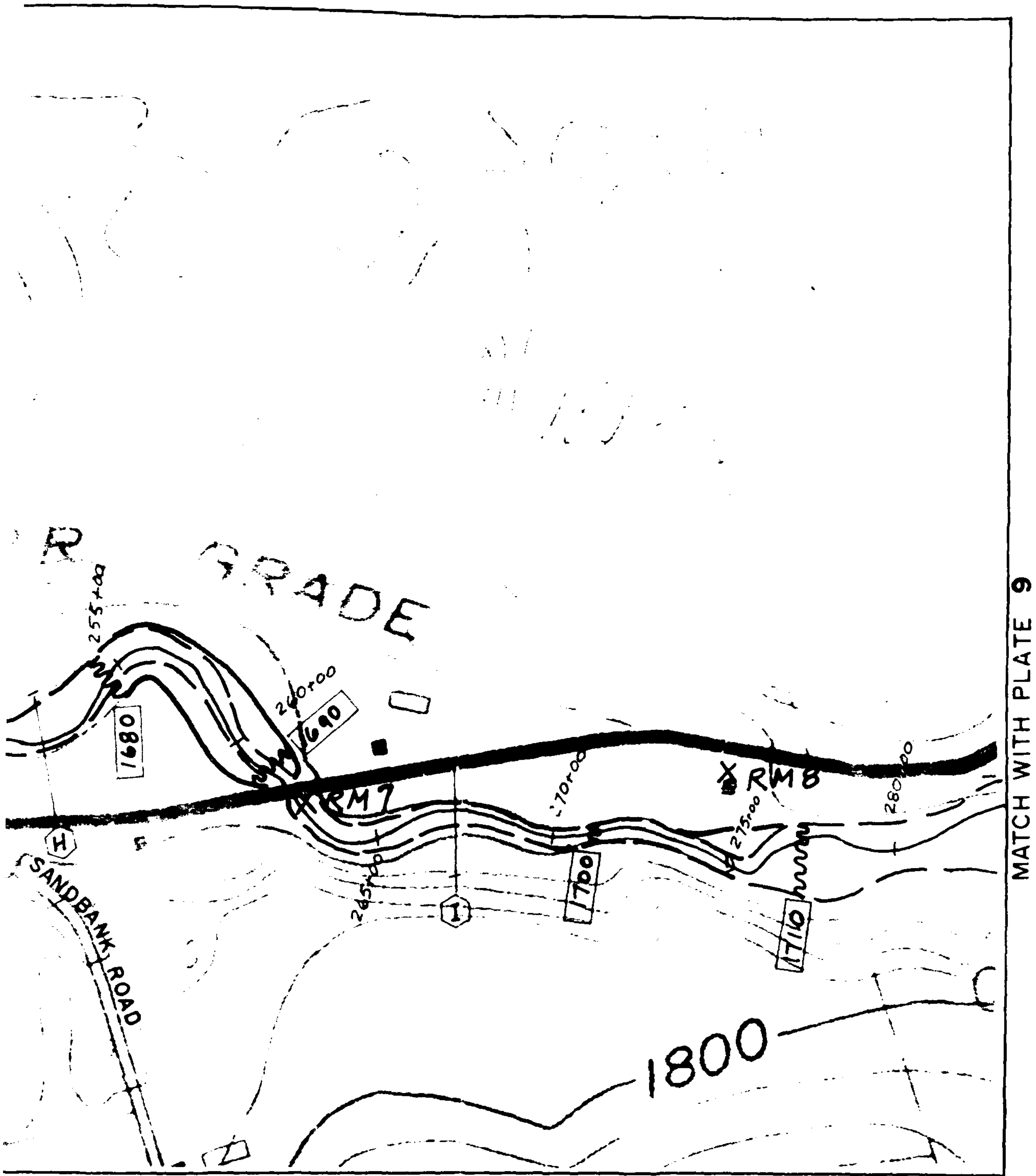
RM1 X ELEVATION REFERENCE MARKS

NOTE: DISTANCE IS MEAS
CONFLUENCE WITH

SCALE IN

400 0

A



MEASURED IN FEET FROM
WITH CATTARAUGUS CREEK.

E IN FEET

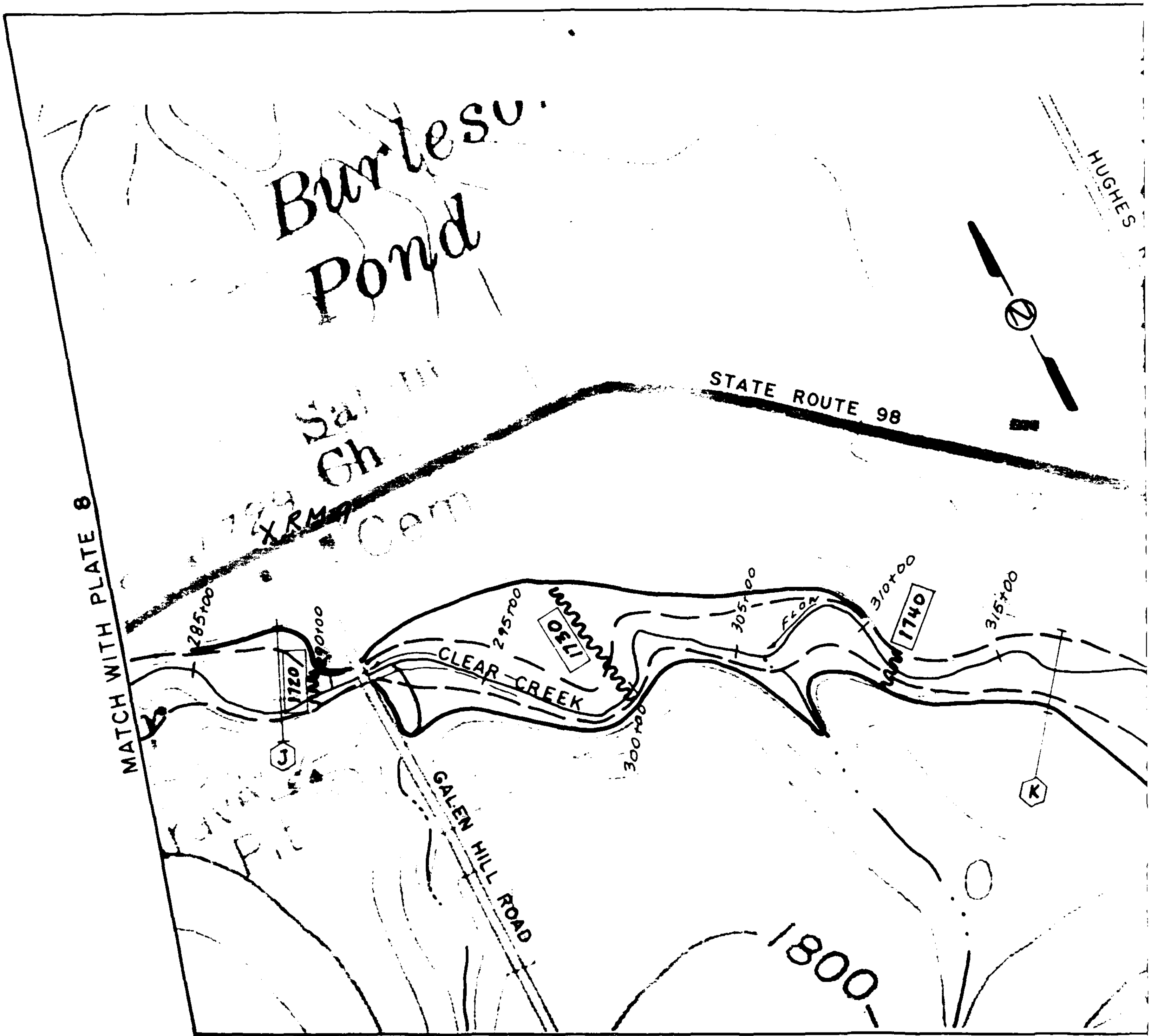
0 400

U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREAS

CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 8 AUGUST 1989



LEGEND:

100-YEAR FLOOD PLAIN BOUNDARY

FLOODWAY BOUNDARY

(K)——(K) CROSS SECTION

1750 BASE FLOOD ELEVATIONS

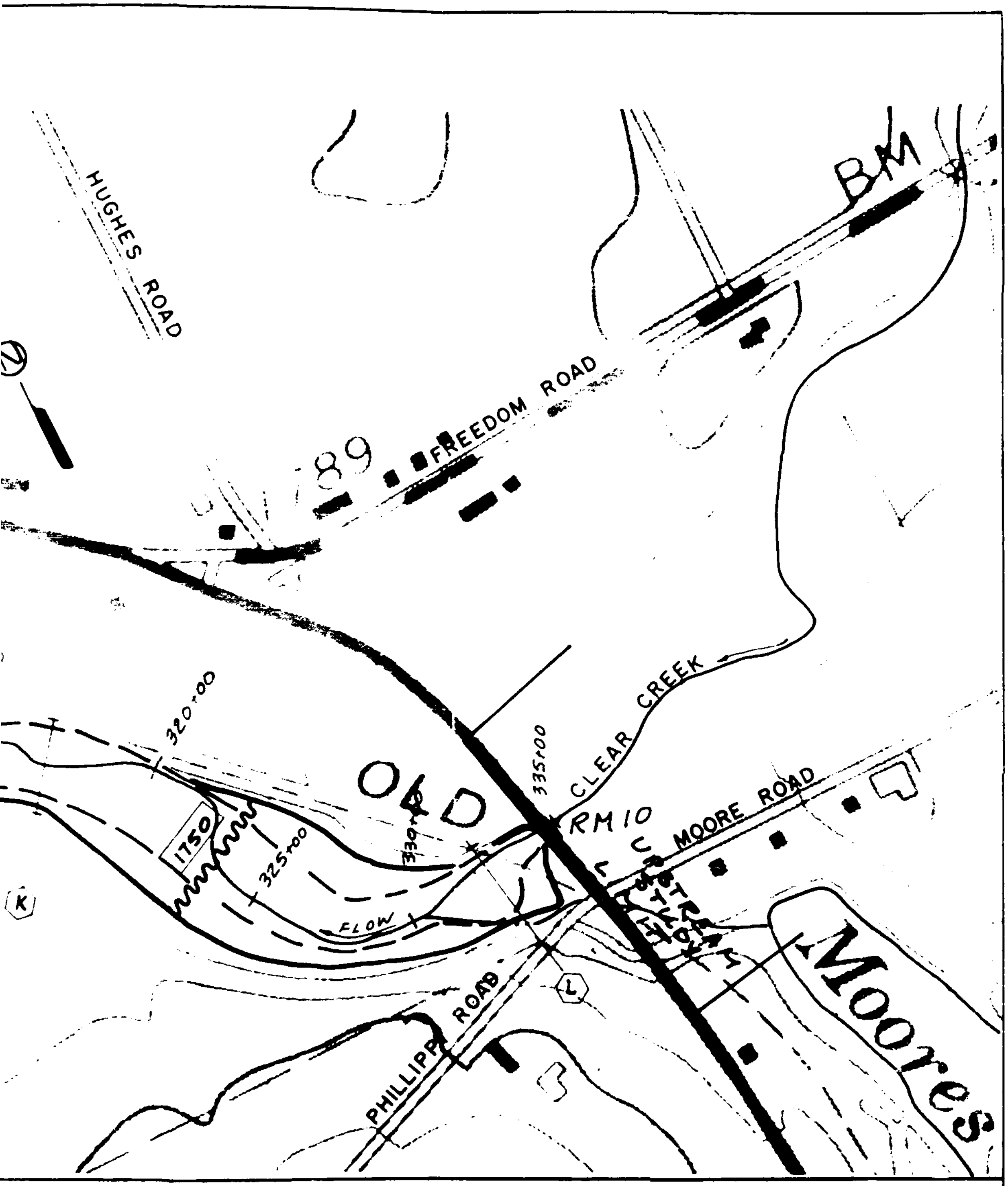
RM1 X ELEVATION REFERENCE MARKS

NOTE: DISTANCE IS MEASURE
CONFLUENCE WITH CA

SCALE IN FEE

400 0

A



IS MEASURED IN FEET FROM
ICE WITH CATTARAUGUS CREEK.

CALE IN FEET

0 400

U. S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREAS
CLEAR CREEK
TOWN OF FREEDOM, N.Y.

PLATE 9 AUGUST 1989